

specimen I took in Mahabaleshwar was flying with *malaya thwaitsei*.

I would suggest that the species does occur in Maharashtra even if it is extremely rare. As it is a very weak flier and found so far inland, I would certainly not consider it to be a 'wind blow'.

Appias wardi: I mentioned this species in an article in the *JBNHS* some 40 odd years ago. I took a

single male at Colaba on 5.vii.1957, but feel that this specimen may well have been wind blown from much further south.

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28. STUDIES ON THE ODONATA (INSECTA) FROM A BACKWATER SWAMP OF NORTHERN KERALA

Our present knowledge on the odonate fauna of estuarine and brackish water environments in India is confined to the state of Orissa and West Bengal on the east coast (Fraser and Drover 1921, Prasad and Ghosh 1982, 1988). Studies on odonates from the brackish water areas of the west coast of India have not been attempted earlier. Hence, this study was taken up at Chemballikundu, a backwater swamp in north Kerala from August 1999 to September 2000.

Chemballikundu swamp is a floodplain parallel to the Ezhimala hills, formed by rivers Ramapuram, Peruvamba and Kavaayi in Kannur district, situated at 12° 31' N and 75° 14' E. The area receives a mean annual rainfall of 3,000 mm, mainly from the southwest monsoon, from June to September. Maximum and minimum temperatures of 33.4 °C and 18.7 °C are experienced in April and December respectively.

Due to the variation in salinity over the seasons, the vegetation of the area is diverse, comprising of species such as *Nymphaea nouchali*, *Nymphoides indicus*, *Limnophylla heterophylla* and *Hydrilla verticillata*, mixed with tall reeds like *Mariscus javanicus*, *Fimbristylis ovata*, *F. ferruginea* and *F. aestivalis*. The embankments along the marshes and mudflats are covered with patches of mangrove species like *Avicennia officinalis*, *A. marina*, *Excoecaria agallocha*, *Aegiceras corniculatum*, *Achrosticum aureum* and *Acanthus ilicifolius*. The varying microhabitats provide good foraging and breeding grounds for many insects. The water is saline, except for a brief period during monsoon. Collections were made during October 1999 (post-monsoon), February-April 2000 (pre-monsoon) and July-September 2000 (monsoon), to

record seasonal variation and other related data. The odonates collected or observed are categorised as follows:

- A = Abundant: More than 15 observed during each visit/season
- C = Common: More than 8 observed during each visit/season
- UC = Uncommon: Not more than 4 observed during each visit/season
- R = Rare: Less than 4 observed during each visit/season
- NF = Not Found: Not observed during the season.

A total of 21 species of odonates under 19 genera belonging to 3 families were recorded from the wetlands of Chemballikundu. The suborders Zygoptera (damselflies) and Anisoptera (dragonflies) were represented by 8 and 13 species respectively. All the species are new reports from the area, and also from the estuarine ecosystem of western India, whereas *Aciagrion occidentale* and *Mortonagrion varralli* are new additions to the estuarine Odonata of India.

The seasonal collection showed a diversity of 20 species in post monsoon, 12 species in monsoon and 9 species in pre-monsoon. The low species diversity in summer may be due to high salinity resulting from the lowering of water level for aquacultural practices. In summer, the aquatic vegetation and reed beds dry up and the entire ecosystem changes till the onset of the Southwest monsoon. Species such as *Pseudagrion microcephalum*, *Mortonagrion varralli*, *Orthetrum sabina sabina*, *Brachythemis contaminata*, *Diplacodes trivialis*, *Pantala flavescens* and *Tholymis tillarga* were recorded throughout the survey, indicating multivoltinity. The species were identified from the FAUNA

OF BRITISH INDIA SERIES (Fraser 1933-36). The nomenclature follows Fraser (1957), and Prasad and Varshney (1995). A detailed systematic account with data on collection, status and habitat of the species recorded and notes on behaviour, and ecology of some species is given below.

Breeding activities: Intense breeding activity was observed mostly during monsoon and post-monsoon. During July 2000, *Diplacodes trivialis* was observed in wheel position and *Tholymis tillarga* ovipositing on the open water surface. September was favourable for damselflies for mating and oviposition. Many pairs of *Pseudagrion microcephalum* and *Ceriagrion cerinorubellum* were seen in tandem, ovipositing on *Nymphaea nouchali* leaves, intermittently resting on the tall *Fimbristylis* grasses. Pairs of *Rhyothemis variegata variegata* were observed in tandem, hovering over the vegetation during September.

Emergence: Swarms of newly emerged *Diplacodes trivialis* were observed among the sedges bordering the bunds in monsoon (July, 2000). Interestingly, they were not seen during the September survey. Exuviae and emerging swarms of *Trithemis pallidinervis* were seen in September among the mangrove thickets.

Roosting: A small roosting population of *Tholymis tillarga* was observed on *Aegiceras corniculatum*, a small mangrove shrub near the marshland, at around 1900 hrs in July 2000. Mass roosting of *Pantala flavescens* was seen on the tall *Fimbristylis* grasses and *Hygroplita* plants lining the creeks towards dusk (1910 hrs), in July. *Mortonagrion varralli* were seen roosting among the shoreline grasses.

Accompanying behaviour: A small group of 8 individuals of *Brachythemis contaminata* was observed accompanying one of the authors (MJP) during the collection trip. The swarm moved parallel to him, at a height of about 60 cm. When the author stopped to net them, they dispersed; some hovered, some perched on grass. When he resumed wading through the swamp, they followed him. This continued over a distance of c. 200 m. Swarms of *Trithemis pallidinervis* also exhibited similar behaviour along the trek path lining the wetlands in September.

Predators: The Chemballickundu wetlands are known for diversity of birds (Jafer 2000). A flock of Blue-tailed Bee-eater (*Merops philippinus*), and Black Drongo (*Dicrurus macrocercus*) were seen capturing larger species of odonates like *Pantala flavescens* and *Tramea limbata similata*, especially in July and September, when the prey species were abundant.

SYSTEMATIC ACCOUNT

Suborder: Zygoptera
Superfamily: Coenagrionoidea
Family: Coenagrionidae
Subfamily: Pseudagrioninae

1. *Ceriagrion cerinorubellum* (Brauer 1865)

Material examined: 1M, 1F; 1.x.1999. 2M, 2F; 14.ix.2000.

Field notes: Abundant among sedges along with *Pseudagrion microcephalum* immediately after the monsoon. Many pairs observed in tandem, ovipositing on the floating leaves of *Nymphaea nouchali*, during September, 2000.

Status: Pre-monsoon: NF, Monsoon: C, Post-monsoon: A.

2. *Ceriagrion coromandelianum* (Fabricius 1798)

Material examined: 1M; 1.x.1999.

Field notes: Common during the monsoon, frequents reed beds and aquatic grasses.

Status: Pre-monsoon: NF, Monsoon: R, Post-monsoon: C.

3. *Pseudagrion microcephalum* (Rambur 1842)

Material examined: 1M, 1F; 1.x.1999. 1F; 2.i.2000. 2F; 21.vii.2000. 2M, 3F; 14.xi.2000.

Field notes: Most common. Males regularly collected throughout the survey from the bund lines, observed slowly sailing through the tall reeds. Abundant immediately after monsoon. Pairs found in tandem and wheel position, also seen ovipositing on *Linnophylla heterophylla* and *Nymphaea nouchali* leaves, in tandem.

Status: Pre-monsoon: C, Monsoon: A, Post-monsoon: A.

Subfamily: Ischnurinae

4. *Aciagrion occidentale* Laidlaw, 1919

Material examined: 1F; 14.ix.2000.

Field notes: Common during post-monsoon, mixing with *Mortonagrion varralli* among the sedges.

Status: Pre-monsoon: NF, Monsoon: NF, Post-monsoon: C.

5. *Ischnura aurora aurora* (Brauer 1865)

Material examined: 1M; 1.x.1999. 1M; 14.ix.2000.

Field notes: Common. Observed only during post-monsoon. Mainly found among the sedges lining the aquacultural ponds.

Status: Pre-monsoon: NF, Monsoon: NF, Post-monsoon: C.

6. *Ischnura senegalensis* (Rambur 1842)

Material examined: 1F; 18.ii.2000.

Field notes: Common during pre-monsoon.

Status: Pre-monsoon: C, Monsoon: NF, Post-monsoon: NF.

Subfamily: Agriocnemidinae

7. *Agriocnemis pygmaea* (Rambur 1842)

Material: 1M; 1.x.1999.

Field notes: Common during post-monsoon. Frequents grasslands on the banks of the swamp.

Status: Pre-monsoon: NF, Monsoon: NF, Post-monsoon: C.

8. *Mortonagrion varralli* Fraser 1920

Material examined: 1M; 2.i.2000. 4M; 23.vii.2000. 3M, 2F; 14.ix.2000.

Field notes: Abundant. Found among the littoral vegetation in good numbers towards dusk throughout the survey.

Status: Pre-monsoon: C, Monsoon: C, Post-monsoon: A.

Suborder: Anisoptera

Superfamily: Aeshnoidea

Family: Gomphidae

Subfamily: Lindeniinae

9. *Ictinogomphus rapax* (Rambur 1842)

Field notes: Uncommon. Frequents paddy fields, reed beds and other aquatic vegetation during the monsoon and post-monsoon.

Status: Pre-monsoon: NF, Monsoon: UC, Post-monsoon: R.

Family: Libellulidae

Subfamily: Libellulinae

10. *Orthetrum sabina sabina* (Drury 1770)

Material examined: 1M; 2.i.2000.

Field notes: Common. Observed throughout the season, hovering over the mangrove vegetation.

Status: Pre-monsoon: C, Monsoon: C, Post-monsoon: C.

Subfamily: Sympetrinae

11. *Acisoma panorpoides panorpoides* Rambur 1842

Material examined: 1M; 1.x.1999.

Field notes: Uncommon. A single specimen collected in October from tall *Fimbristylis* grass.

Status: Pre-monsoon: NF, Monsoon: NF, Post-monsoon: UC.

12. *Brachythemis contaminata* (Fabricius 1793)

Material examined: 2M, 1F; 1.x.1999; 1F; 14.ix.2000.

Field notes: Commonly observed throughout the study, among the emerging macrophytes of the creeks. Abundant after monsoon.

Status: Pre-monsoon: R, Monsoon: C, Post-monsoon: A.

13. *Crocothemis servilia servilia* (Drury 1770)

Material examined: 1M; 1.x.1999.

Field notes: Common. Found throughout the study, except in summer, in and around paddy fields.

Status: Pre-monsoon: R, Monsoon: C, Post-monsoon: C.

14. *Diplacodes trivialis* (Rambur 1842)

Material examined: 2M, 2F; 1.x.1999. 1F; 21.vii.2000. 1F; 14.ix.2000.

Field notes: Abundant. Observed throughout the survey along the shoreline vegetation. During July, unusually large numbers of teneral forms were found congregating on the shore. Breeding pairs were seen in July.

Status: Pre-monsoon: UC, Monsoon: A, Post-monsoon: UC.

15. *Neurothemis tullia tullia* (Drury 1773)

Field notes: Uncommon. Frequents reed beds and paddy fields, especially during monsoon.

Status: Pre-monsoon: NF, Monsoon: R, Post-monsoon: UC.

Subfamily: Trithemistinae

16. *Trithemis pallidinervis* (Kirby 1889)

Material examined: 1M, 2F; 14.x.2000.

Field notes: Abundant during September. Swarms of this species found fluttering around the thickets of grass near aquaculture ponds.

Status: Pre-monsoon: NF, Monsoon: A, Post-monsoon: A.

Subfamily: Trameinae

17. *Rhyothemis variegata variegata* (Linnaeus 1763)

Material examined: 1F; 14.ix.2000.

Field Notes: Abundant, swarms active during the post-monsoon. Breeding activities observed during September.

Status: Pre-monsoon: NF, Monsoon: A, Post-monsoon: A.

18. *Pantala flavescens* (Fabricius 1798)

Material examined: 1F; 23.vii.2000. 1M; 14.ix.2000.

Field notes: Swarms of this species observed throughout the survey. Activities intense during post-monsoon.

Status: Pre-monsoon: C, Monsoon: UC, Post-monsoon: A.

19. *Tramea limbata similata* Rambur 1842

Material examined: 1M; 14.ix.2000.

Field notes: Common in September. Found soaring over the wetlands along with *Pantala flavescens*.

Status: Pre-monsoon: NF, Monsoon: C, Post-monsoon: C.

20. *Tholymis tillarga* (Fabricius 1798)

Material examined: 1F; 1.x.1999, 1M; 21.vii.2000.

Field notes: Observed throughout the survey. Abundant in monsoon. Found patrolling all along the wetland area with great speed and agility towards dusk. Many specimens found hanging on the twigs of *Aegicerus corniculatum* at c.1840 hrs on a rainy day.

Status: Pre-monsoon: C, Monsoon: A, Post-monsoon: C.

21. *Macrodiplax cora* (Brauer 1867)

Material examined: 1M; 1.x.1999.

Field notes: Rare. A single specimen collected immediately after the monsoon.

Status: Pre-monsoon: NF, Monsoon: NF, Post-monsoon: R.

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29. THE PULMONATE SNAIL *OPEAS GRACILE* (HUTTON),
STYLOMMATOPHORA: SUBULINIDAE: OPEATINAE — A NEW RECORD
FROM JAMMU PROVINCE, JAMMU AND KASHMIR STATE

In the literature on the malacofauna of Jammu Province of Jammu and Kashmir State (Theobald 1878, Verma *et al.* 1996, and Duda *et al.* 1999) the stylommatophore gastropods reported from Jammu Province are: *Ena (Subzebrinus) arcuatus* Pfeiffer (Family Enidae), *Anadenus altivagus* (Theobald) (Family Arionidae), *Bensonia jammuensis* (Theobald),

B. monticola (Hutton), *Euanstenia monticola* (Hutton), *Syama splendens* (Hutton) (Family Ariophantidae), *Limax maximus* Ferrusac (Family Limacidae) and *Planispira* sp. (Family Helicidae).

While collecting molluscs of Jammu and Kashmir State, we obtained several specimens of the pulmonate snail *Opeas gracile* (Hutton) (Subulinidae: Opeatinae)